

Chapter Three:

Revolutionizing the Structure of STS: Bringing to Light Thomas Kuhn's Noble Lie

It is not for nothing, he said, that you were so bashful about coming out with your lie.

It was quite natural that I should be, I said, but all the same hear the rest of the story. While all of you in the city are brothers, we will say in our tale, yet God in fashioning those of you who are fitted to hold rule mingled gold in their generation, for which reason they are the most precious – but in the helpers silver, and iron and brass in the farmers and other craftsmen. (Republic III, 415b)

Kuhn thought he was understanding science 'as it is in itself' but in fact he merely produced another 'noble lie', which explains why it turned out to be so popular and why Kuhn's own thinking could never progress beyond its original brilliant formation in Structure. (Steve Fuller, 1997)

3.1 General Introduction

This chapter traces the effect of relativist, subjectivist interpretations of Thomas Kuhn's *The Structure of Scientific Revolutions* (1962) on science and technology studies (STS).¹ An emerging consensus on behalf of STS practitioners, and critics of STS alike, is that *Structure* was fundamentally misinterpreted.² Within STS the most recent, thorough examination of the Kuhnian legacy from a socio-historic perspective has been mounted by Steve Fuller. Fuller claims that "Kuhnianism", an extension of James Bryant Conant's political will, suppressed the activist impulses energizing early STS by "normalizing", through properly designed historical pedagogy, the relationship between science and society. Where Fuller moves to place the reception of Kuhn within a socio-historic framework, I examine the impact of relativist interpretations of *Structure* on STS. What STS took as the radical implications of Kuhn's account had the rhetorical effect of making science seem more like (or *just like*) other social

¹ The contention, which Kuhn went to great pains to address, was that scientists had no rational basis for choosing one theory or paradigm over another given an apparent absence of shared criteria, standards and rules to which to refer. The tension between Kuhn's emphasis on community socialization in science, and dependence on individual preferences (a consequence of Kuhn's historicism) as the basis for scientific revolutions, continues to vex readers of *Structure*.

² Criticism of STS implies that Kuhn (as well Rorty and Quine) is used as justification for relativist epistemology. Kuhn, of course, denied this implication of his work. Critics within STS agree that *Structure* was misappropriated and Kuhn was used as a stalking-horse for social constructivists. Disagreements in STS, however, center on the means and ends of re-interpreting Kuhn.

institutions.³ The relativist interpretation of *Structure* helped dissipate the pressure of the 1960s social critique of science and technology. As well, Fuller contends, new academic fields, like STS, that sprung up in the wake of 1960s cultural change saw, in *Structure*, a blueprint for developing discipline and research-like activities. STS, specifically, coalesced into a form of paradigm-governed research bound to the tenets of social constructivism. To throw off the constraints forged by constructivist interpretations of *Structure*, I suggest Kuhn provided an “out” folded into the developmental theory from which he borrowed. Kuhn’s own appeal to historical contexts is highly suggestive of another stage necessary for the development of science – a governing conscience.

Section 3.2 establishes *Structure* as the founding text of STS and traces Fuller’s analysis of the socio-historic fallout of the Kuhnian legacy. Section 3.3 traces *Structure*’s popular influence and examines Fuller’s appeal to the rhetoric of science to make STS more politically relevant. Acquiring other disciplinary tools does little good, I argue, if STS continues to dig in the same constructivist ditch. The blueprint that Kuhn set out in *Structure*, Fuller argues, and as I will describe in section 3.4, enabled weak and endangered disciplines to mimic science by performing paradigm-based research. The humanities and social sciences, particularly, adopted the language of Kuhn. Still, the Kuhnian blueprint, on the social constructivist interpretation, treated all explanations in the same way. No external criteria exist for distinguishing among types of social construction. However, *Structure* lends itself to many readings. In section 3.5, I offer a speculative argument. Kuhn appealed to historical contexts to explain the structure of science. Social constructivists appeal to a broad range of contexts in order to interpret and explain science. Context is given, by Kuhn and constructivists alike, a privileged epistemological and ontological position. Looking at the developmental theory employed in *Structure* which was adopted from Piaget and Bruner, and integrated with the neo-Kantian constructivism of Goodman, I argue the appeal to context implies a form of meta-scientific realism. Kuhn, for example, in appealing to historical categories to provide the

³ In critical broadsides of STS, relativism and constructivism are often used interchangeably. I refer to epistemological relativism in which the acceptability or unacceptability of knowledge claims is relative to a particular group or community. Kuhn is credited with suggesting all decisions about theories are relative to given paradigms, and, generally, is labeled a relativist. However, Kuhn vacillates on his position. He does, as Hoyningen-Huene points out (*Reconstructing Scientific Revolutions: Thomas S. Kuhn’s Philosophy of Science* Chicago: University of Chicago Press, 1993, 76) posit the existence of an “object-side” (Hoyningen-Huene’s term) to science to which the best scientific theories hold verisimilitude. However, as one cannot empirically, directly access the object-side of science, the best we can get at are proper constructions. According to Hoyningen-Huene (76-77): “... Kuhn admits that his position can’t be labeled as unqualifiedly realist ... since it insists that similarity relations contain a genetically subject-side moment and hence that a world constituted by such relations can’t be, as realism would have it, purely object-sided.” If, on the social constructivist account, science is just like any other ideologically driven social institution, then it is not a distant, unintelligible resource; rather science is a social corollary to other institutions and can be accessed as such.

actual (or real) structure of science, hedged his bets against being bound to paradigm-governed explanations. Contexts offered, operationally, meta-realist categories from which the structure of science could be known. Like a growing child, science could develop an independent mechanism for judging its actions. The appeal to context offered a bootstrap process for second-order analysis of paradigm-bound research. Section 3.6 shows how the appeal to meta-level criteria might cash out pedagogically; if not headed off by constructivist and postmodern conceptions of communicators, texts and audiences.

3.2 Argument Summary

Thomas S. Kuhn's *The Structure of Scientific Revolutions* (1962) is the founding text of Science and Technology Studies (STS).⁴ An interpretation of *Structure* as undermining the rationality of the scientific process explains the prevalence of social constructivism in STS.⁵

⁴ David Hess notes (*Science Studies: An Advanced Introduction*. New York: New York University Press, 1997) that *Structure*: "... had a substantial impact on both the philosophy and social studies of science, but after the 1970s the impact was increasingly that of a foil against which other positions and theories were articulated ... By the 1990s the importance of the *Structure of Scientific Revolutions* within STS was generally seen as historical rather than contemporary, and many regarded the historical influence as a conservative one in the sense that it continued rather than challenged fundamental theories in social studies and philosophy. However, outside STS circles Kuhn's work continued to have a life of its own as scientists, popular writers, and others continued to talk about his revolutionary ideas about revolutions" (23-24). Kuhn's influence on the pedagogical foundation of the Edinburgh school can be seen in David Bloor's "A Philosophical Approach to Science," *Social Studies of Science* 5: 1975, 507-517. Fuller (1998, forthcoming, Chapter 7, op cit. 1) mentions that Bloor saw the course as dealing with "a closely knit-knit set of issues connected with T.S. Kuhn's *The Structure of Scientific Revolutions*" (507). *Structure*, according to Fuller, is the only book used since the beginning of the Science Studies Unit in 1967, and the only one required to be purchased by students. Barry Barnes offers the most detailed account of the connections between Kuhn's work and approaches in the Edinburgh School in *T.S. Kuhn and Social Science* (London: Macmillan, 1982). Thomas Gieryn ("Boundaries of Science" Jasanoff et al. (eds.) *Handbook of Science and Technology Studies* London: Sage, 1995, 393-443) mentions in "... looking back on Kuhn from a perspective shaped by 10 years of constructivist empirical studies of boundary-work, a case can be made that he set that line of inquiry [demarcating science and non-science] in motion more as foil than as pioneer" (401). David Edge ("Reinventing the Wheel" Jasanoff et al. eds. *Handbook of Science and Technology Studies* London: Sage, 1995, 3-23) states that the sociology of scientific knowledge "... drew much of its initial inspiration from the work of Thomas Kuhn..." (7). Kuhn is also posed as a "foil" against Karl Popper's conception of science in David Bloor's articulation of the Strong Programme (see Chapter 4 of *Knowledge and Social Imagery* Chicago: University of Chicago Press, 1976). Finally, Pickering ("Science: From Knowledge to Practice" *Science as Practice and Culture* Chicago: University of Chicago Press, 1992, 7) claims: "All stock appreciations of scientific knowledge – as objective (logical empiricism), as relative to culture (Kuhn, Feyerabend), as relative to interests (SSK) – can be translated into particular understanding of scientific practice." Thus, the notion of "practice" subsumes Kuhn's social theory. Sociologists of science portray Kuhn as an ideal type, the "founding foil", against which their form of inquiry is juxtaposed. Nevertheless, the programmatic approach to the study of science from historical, sociological and philosophical perspectives (the methodological signature of STS) is initially, and uniquely, expressed in *Structure*.

⁵ Ernan McMullin ("Rationality and Paradigm Change in Science" from *World Changes: Thomas Kuhn and the Nature of Science* Paul Horwich (ed.) Cambridge, MA: MIT Press, 1993, 55-78) notes the "near unanimity" of early interpretations of *Structure* (throughout the 1960s) which, focusing on gestalt switch metaphors, concluded the move from one paradigm to another lacked a rational basis. Since no apparent basis existed for translating concepts from one paradigm to another, or for explicating paradigm conversion (Kuhn (1977) compares paradigm conversion to historians imparting motives on scientific actors), Kuhn's views were labeled subjectivist. Kuhn's attempt to ward off this radical interpretations in the 2nd edition of *Structure*

The conception of scientific change as a fundamentally subjective “conversion experience” fueled radical relativist interpretations of science. Seizing upon the neo-Kantian constructivism Kuhn (following Harvard colleagues Jerome Bruner, Leo Postman and Nelson Goodman) embraced, sociologists of science shifted the analytical locus from individual cognition to social interaction. On a social constructivist account the real world could not be assumed *a priori*. Since the real world had no privileged ontological status, neither did the science describing it. The world was a by-product of social interactions which did, and did not, include science. As Kuhn failed to articulate external criteria for paradigm choice, science was seen as the outcome of local social negotiation. In STS, the dominance of the Strong Programme in the sociology of knowledge, with its attendant constructivism, shaped, and was shaped by, widely held interpretations of Kuhnian relativism. Recent criticisms of STS (Gross and Levitt 1994, Gross, Levitt and Lewis (eds.), 1996) turn, in part, on the realization that Kuhn has been fundamentally misunderstood by the constructivists.⁶

Since his death in 1996, and with the rush to map the twentieth century intellectual landscape, the reassessment of Kuhn’s influence has become a cottage industry. Within STS, however, the most sustained examination of Kuhn’s current influence has been performed by Steve Fuller.⁷ In research beginning, most notably, in 1992, Fuller argues that Kuhn’s effect in

(1970) and in “Objectivity, Value Judgment and Theory Choice” (1977) failed. Laudan (*Science and Values: The Aims of Science and Their Role in Scientific Debate* Berkeley: University of California Press, 1984, 67-102) admits that he, among others in the 1970s, was seduced by Kuhn’s account of paradigm change as a profound break in the conduct of science. Laudan counters early interpretation of Kuhn in arguing that paradigm changes in influence by pragmatic and epistemic considerations which are not vague and individually idiosyncratic.

⁶ Gross and Levitt (*Higher Superstition: The Academic Left and Its Quarrels With Science* Baltimore: Johns Hopkins University Press, 1994) briefly compare Stephen J. Gould with Kuhn: “Gould knows perfectly well that in the long run logic, empirical evidence, and explanatory parsimony are the master (with apology to our feminist friends for the metaphor) in the house of science. In this he echoes Thomas Kuhn, whose work has so often been vulgarized and distorted by the cultural constructivist school” (56). Gross and Levitt prefer to use the term “cultural constructivism”; their definition: “Sociologists and social theorists, including quite a few Marxists, tend to produce what may be called a ‘cultural constructivist’ analyses, viewing scientific knowledge as historically and socially situated and encoding, in acknowledged ways, prevailing social prejudices. The strongest and most aggressive versions of these theories view science as wholly social product, a mere set of *conventions* generated by social practice (original emphasis, 11). Boyd, Gasper and Trout’s (eds.) (*The Philosophy of Science* Cambridge, MA: MIT Press, 1991) textbook definition of constructivism is: “The view that the subject matter of scientific research is wholly or partly constructed by the background theoretical assumptions of the scientific community, and thus is not, as realists claim, largely independent of our thoughts and theoretical commitments” (775). Boyd et al. make a distinction regarding Neo-Kantianism which is defined as: “Another name for constructivism, the view that the reality described by our scientific theories is a social and intellectual construct and this is not, as realists claim, largely independent of our thoughts and theoretical commitments. The name suggests an association with the views of ... Immanuel Kant, but this association is exegetically controversial” (779). Absent the polemic, Gross and Levitt’s definition would be recognized by a social constructivist.

⁷ Kuhn’s presence is felt in Fuller’s early work (see 1988 especially 85-89, 111-119 and 219-224). Fuller’s most significant work on Kuhn, “Being There With Thomas Kuhn: A Parable for Postmodern Times” (*History and Theory* Volume 31, No. 3, 241-275, 1992) landed, according to the author (1997, 130), a book contract from the University of Chicago Press and is the centerpiece of his forthcoming (1998) book. Additionally, I analyze Fuller’s work on Kuhn in 1994 (“Teaching Thomas Kuhn to Teach the Cold War Vision of Science”

Structure was “conservative” – the radical implications of a postpositivist critique of science (a la Feyerabend’s *Against Method*) were sidetracked by the book’s improbable popularity.⁸ What many social scientists and humanists realized, while lost on Kuhn, was that *Structure* contained narrative and methodological elements which, once appropriated, could reconstitute their field of inquiry into a “science.” Readers focused on Kuhn’s apparent historical determinism which indicated that a measure of a field’s success was proportionate to a research community’s commitment to a single paradigm. If a unified theory could be reached or if practitioners would apply a uniform set of methods or standards, a given field would display evolutionary progress and acquire influence. Increased specialization was taken as a sign of a highly developed research tradition.⁹ The brand of interdisciplinarity credited to Kuhn held an additional promise; garnering cognitive and social “reflexive awareness” through routinizing disciplinary practices. The process Fuller has coined “Kuhnification” has seemingly become a way to endorse interdisciplinary values while preserving aspects of programmatic integrity.¹⁰

Contention, Vol. 4, No. 1, 81-106) and Chapter 7 from his forthcoming book *Being There With Thomas Kuhn: A Philosophical History of Our Times* (Chicago: University of Chicago Press, 1998), “Kuhnification as Ritualized Political Impotence: The Hidden History of Science Studies” (Chapter 7). A germ of Fuller’s critique of Kuhn can be found in 1989 (“Philosophy of Science Since Kuhn: Readings on the Revolution That Has Yet To Come” *Choice* 26: 593-603). As well, Fuller has addressed Kuhn’s influence, particularly on the philosophy of science, in three previous books (1988, 1989, 1993).

⁸ Fuller sites the development of the Edinburgh School curriculum as evidence of Kuhn’s conservative influence. Radical (i.e., Marxist) critique was replaced by the founding members of STS looking to find a home in traditional academic settings by pursuing the trappings of disciplinarity – establishing the requisite peer reviewed journals and ensuring growth and success by cross-disciplinary citation to “approved authors” (Fuller, Chapter 7 *Kuhnification as Ritualized Political Impotence: The Hidden History of Science Studies* in *Being There With Thomas Kuhn: A Philosophical History of Our Times* (Chicago: University of Chicago Press, forthcoming). Russell Jacoby (1987, 141) illustrates how tight the circle of academic co-optation can be: “Younger professors [hired in the late 1960 and early 1970s] did not passively accept the academic disciplines they found. By establishing a credible body of radical, feminist, Marxist and neo-Marxist scholarship, they assailed the venerable, sometimes almost official, interpretations dominant in their fields. The extent of this literature, the outpouring of left academics, is extraordinary ...[and] irrevocable. Yet it is extraordinary for another reason; it is largely technical, unreadable and – except by specialists – unread. While New Left intellectuals obtain secure positions in central institutions, the deepest irony marks their achievement. Their scholarship looks more and more like the work it sought to subvert.” If academia acts as a place to house, control and disable, as necessary, radical intellectual critique, *Structure* may have acted as just another cultural medium.

⁹ Steve Fuller, “Confessions of a Recovering Kuhnian” (*Social Studies of Science*, Vol. 27, No. 5, 1997): “An unintended consequence ... of Kuhn’s account was that it made it easy for all forms of inquiries to reinvent themselves as paradigms. Often the method of reinvention has been as simple as rewriting a discipline’s history in Kuhn-speak and imposing a regime of careful cross-citation of the journal literature, which together conveyed the impression (again, especially to policymakers) that the discipline was purposefully engaged in the quest for knowledge. Kuhn actively distanced himself from these appropriations, arguing that *Structure* really only applied to the physical sciences. Nevertheless, the overall effect has contributed to the original mission of Conant’s courses, since many humanists and social scientists who might otherwise have been critical of the natural sciences have come to think that they can imitate those still-authoritative fields of inquiries by practicing some normal science of their own. The historical lesson taught by *Structure*, then, seems to be ‘If you can’t beat ‘em, join ‘em.’”

¹⁰ While recently attributed (“Kuhnification as Ritualized Political Impotence: The Hidden History of Science Studies” Chapter 7 of *Being There With Thomas Kuhn: A Philosophical History of Our Times* Chicago:

Fuller argues that Kuhn was a cold warrior in the service of Harvard President James Bryant Conant.¹¹ Conant's conservative agenda, promulgated in Harvard's General Education program, cast the relationship of science and society as one in which "... every American citizen in the second half of this century would be well advised to try to understand both science and scientists as best he can."¹² The relationship of science to society forwarded by Conant and given theoretical purchase by Kuhn was, according to Fuller, one in which society would become more like science rather than science becoming more like society.¹³ In a time of rapidly expanding inter- and multi-disciplinary research, *Structure* was received as both a founding text, in STS, and as a blueprint for sanctioning marginalized fields of inquiry.¹⁴ For Fuller the

University of Chicago Press, 1998, forthcoming), Fuller's thesis of "Kuhnification" is forwarded initially in 1992 ("Being There With Thomas Kuhn: A Parable for Postmodern Times" *History and Theory* Vol. 31, No. 3, 1992). Kuhnification is a process in which academic disciplines appropriate, to varying degrees, the language, problem-solving style, and methodological structure. Thomas Kuhn describes in *The Structure of Scientific Revolutions* as a necessary condition for progress in the natural sciences. Like the rhetorical triumph grudgingly credited to Robert Boyle by Shapin and Schaffer (*The Leviathan and the Air-Pump*, Princeton: Princeton University Press, 1985) which preserved natural science during unstable political, economic and religious times, Kuhn seemingly provided the linguistic means by which alienated academic disciplines could preserve their work in much the same way under the similar conditions. Fuller argues Kuhnification has co-opted the radical, normative implications of STS research which would question "... the ends of science as well as the means" ("Being There With Thomas Kuhn", 274). But the implications of Kuhnification run much deeper.

¹¹ Fuller is somewhat at odds about the nature of the relationship between Kuhn and Conant. The goal of Conant's General Education program, Fuller proposes was "... part of a larger strategy [credited to Conant] to normalize science's social relations in the rapidly emerging 'Atomic Age'. No doubt many will wish to absolve Kuhn, a mere lecturer in Conant's General Education programme, of any complicity in his mentor's political schemes. Nevertheless, Kuhn's unwillingness to engage with those schemes, either as supporter or critic, made it too easy from him to see science as an autonomous activity whose history, philosophy and sociology can be done in an equally self-contained manner." (1997 130) Conant proclaims that since science will not go away, and may continue to progress rapidly, the lay public should try to understand both science and scientists (see *Science and Common Sense*. New Haven, 1961). With Conant as "the man behind the curtain", Kuhn seemingly develops from a simple instructor in the early 1950s who, with chemist Leonard Nash, used historical case studies to show the logic of scientific progress (see "Harvard Cases Histories in Experimental Science", Cambridge: MA, 1950), to a sophisticated, though unknowing, promoter of Conant's brand of social conservatism in works such as *The Copernican Revolution* (Cambridge, MA, 1957) and *Structure*. In either instance, for Fuller, Kuhn is more static symbol than intentional actor.

¹² James Conant, *Science and Common Sense* (New Haven, 1961), 3.

¹³ Fuller describes what a world in which science is "more like" society in the postscript to *Philosophy, Rhetoric and the End of Knowledge: The Coming of Science and Technology Studies* (Madison: University of Wisconsin Press, 1993). In the "world of tomorrow", science is not a discipline or institution-bound practice, rather a global activity open to social intervention. Theory choice is a matter of a democratically determined, intended effect rather than the process of mapping the world "out there." Scientific expertise is treated critically and the lay public is involved in decisions about the labor and capital which affect scientific conduct. The democratic idealism which sustains Fuller's vision juxtaposed Conant's scientific idealism. Neither position speaks to pragmatic necessity.

¹⁴ An example of jumping on Kuhn's bandwagon to bolster a field can be found in Maxine Hairston's, "The Winds of Change: Thomas Kuhn and the Revolution in the Teaching of Writing," *College Composition and Communication*, Vol. 33 (February 1982), pp. 76-88. Hairston lists twelve "principle features" of the new paradigm which mark a transition from "product" to "process" oriented approaches to composition. While the appropriation of narrative elements from *Structure* serves as a general, rhetorical means for disciplinary legitimation, Hairston also finds a sympathetic association between Kuhn's (from Piaget and Bruner) model of cognitive development and the process model of composition. See also Carol Berkenkotter "Paradigm Debates, Turf Wars, and the Conduct of Sociocognitive Inquiry in Composition" *College Composition and Communication* Vol. 42, No. 2 (May 1991), 151-69.

fruits of the poisonous tree extend throughout STS. As a result STS, like Kuhn himself, lacks a sense of historical place and mission.¹⁵ Properly, according to Fuller, STS should attend to “... contemporary social movements in which sciences figure prominently ...” and should be “... permeable to larger political concerns ...” (1998, forthcoming). Fuller’s reconstruction of Kuhn broadly attacks the theory wing of STS – the “High Church.”¹⁶ Somewhat ironically, Fuller provides, as a consequence of revealing “the hidden history of science studies”, a “didactic macrohistory” not of science, but of STS (1992, 272). Fuller’s turn, by bringing *Structure’s* “noble lie” to light, is to restore a normative awareness beyond Kuhn’s influence – much of which is found in Low Church STS.

¹⁵ Fuller cites evidence on two-fronts (beginning in 1992) to describe Kuhn’s “Orwellian” sense of history. First are Kuhn’s denials of the motives attributed to him – that the significance of his work stands as the death knell of philosophical positivism. Second that Kuhn’s didactic motives in teaching apprentice scientists history was to teach them to identify “... salient aspects of scientific episodes that were necessary for recognizing and resolving some paradigmatic tension” (273-74). Kuhn’s pedagogical orientation, I suggest, was adopted from the Piaget’s developmental theory as interpreted by Jerome Bruner and Nelson Goodman. On the one hand, the resolution of a “paradigmatic tension” is illustrated in Kuhn’s reference to the Bruner and Postman experiments. On the other hand, Kuhn wrestles with the progressive nature of science. Kuhn works out this problem didactically. By appealing to history, Kuhn applied Piaget’s stages of moral development to the scientific enterprise. Using history as the pedagogical instrument, Kuhn drew a correspondence between a mature form of paradigmatic science and verisimilitude to the real world. By using case study experiments to teach apprentice scientists history, Kuhn didactically instilled a sense of the “right practice” of science measured against the “right rendering” of the real world. From canonical case studies, scientists would learn good from bad science through a progressive, utilitarian lens. A mature science, then, can be traced from the determined unfolding of history. Scientific progress could not have happened counter-factually. Fuller objects (echoing Stephen Brush on 257) to the internalist history supporting Kuhn’s rational reconstructions. Kuhnian historiography comes home to roost in the Sociology of Scientific Knowledge (SSK) in what Fuller tabs “internalist sociology.” Claiming that social factors transcend and permeate science in ways not consciously recognized by scientists, and in ways reflexively bracketed by themselves, sociologists claim a critical awareness of the elements that construct scientific knowledge. Consequently, the sociological reconstruction of science makes, not surprisingly, sociology the mature conscience of science (Fuller 1993, 187 refers to Comte in this regard).

¹⁶ Fuller (1993, xiii-xiv) describes two indicators which illustrate the difference between “High Church” and “Low Church” STS: “[...] Both sects like to trace their origins to the 1960s. But whereas the High Church points to Thomas Kuhn’s *The Structure of Scientific Revolutions* ... as the watershed STS text, the Low Church portrays STS as a response to the disturbing symbiosis that had developed between scientific research and the military establishment during the Vietnam War ... The second indicator pertains to the to the different senses in which STS can become more “radical.” High Church radicalism heads toward “reflexivity,” an inward turn whereby STS practitioners apply to their own work the very principles which have enabled them to deconstruct the epistemic authority of the scientists they study. In this phase, STS research is revealed to offer no overarching lessons about the nature of science, but rather specific points that vary significantly across contexts in which STS might be practiced. High Church radicalism tends to undercut Low Church radicalism, which is basically a version of the “emancipatory” politics associated with Western socialist parties. Here the STS practitioner invokes her own internally privileged “standpoint” on science, whose emancipatory capacity is tested by the extent to which it can be made available to the entire citizenry.”

3.3 Kuhn's Influence

Roughly one million copies of *Structure* have been sold worldwide available in sixteen translations.¹⁷ As a cultural phenomenon, Kuhn's work is chronicled as Vice-President Gore's favorite book¹⁸ and the expression "paradigm shift" is included in William Safire's *Dictionary of American Politics*. Hoyningen-Huene (1993, xv) mentions that many terms coined by Kuhn make their way into "... individual scientific fields, and even in many less scientific domains" (xv). *Structure* continues to be one of the most frequently cited books in the humanities and social sciences published in the last half of this century. Kuhn's sweeping influence on academia can hardly be disputed. However, complaints by Kuhn over the reception and misapprehension of *Structure* are well-documented.¹⁹ Clearly *Structure* has been appropriated for innumerable disciplinary and ideological ends, almost all of which Kuhn repudiated.²⁰ Despite these protests, *Structure* has been transformed into an academic commodity that "... has served the

¹⁷ John Horgan "Profile: Reluctant Revolutionary – Thomas S. Kuhn Unleashed 'Paradigm' on the World" *Scientific American* May 1991, 40. Hoyningen-Huene's (*Reconstructing Scientific Revolutions: Thomas S. Kuhn's Philosophy of Science*. Chicago: University of Chicago Press, 1993 xv, op cit. 2) numbers differ slightly. *Structure's* English edition sales exceeded 740,000 by 1990 and were available in nineteen translations.

¹⁸ James Fallows, "Farewell to Laissez-Faire! Clinton Pulls a Reagan on Free-Market Republicans," *Washington Post*, 28 February 1993, sec. C, p.1. See Fuller 1994 op. cit 2; 81, 105.

¹⁹ Kuhn's surprise at, and distancing from, readings emphasizing the radical implications of *Structure* initially appear in the postscript to the second edition and in "Reflections on My Critics" and in Lakatos and Musgrave *Criticism and the Growth of Knowledge* (1970, 231-278). (See also Alan Musgrave's "Kuhn's Second Thoughts" Review of *The Structure of Scientific Revolutions* 2nd ed., by Thomas S. Kuhn. *British Journal for the Philosophy of Science* 22 (1971), 287-297. Reprinted in Gary Gutting's (ed.) *Paradigms and Revolutions* Notre Dame, IN: University of Notre Dame Press 1980). One can argue that Dudley Shapere's review ("The Structure of Scientific Revolutions," *Philosophical Review* 73, 1964, 383-394) positioned *Structure* as "the layperson's guide to the end of positivism" and helped the book become a "text for all seasons." Kuhn's open-ended expository style, especially unusual given the manuscript's solicitation by Rudolph Carnap for the *Encyclopedia of Unified Science*, helped fuel *Structure's* multiple uses and interpretations. Kuhn's personal reaction to Fuller's criticism ("Being There With Thomas Kuhn: A Parable for Postmodern Times" *History and Theory* Volume 31, No. 3, 1992, 241-275) was in keeping with his pose as "reluctant revolutionary" (see Fuller in *History of the Human Sciences* "Thomas Kuhn: A Personal Judgment" Vol. 10, No. 1, February 1997). Failing to dissuade Fuller from interviewing him on July 23, 1993, Kuhn produced a tape recorder at his home in Cambridge, Massachusetts and read a prepared statement. Personal conversations with Fuller suggest that Kuhn wanted to set the record straight; a record which he felt was distorted in *History and Theory*.

²⁰ Robin Fox ("State of the Art/Science in Anthropology" In *The Flight from Science and Reason* Gross, Martin and Lewis (eds.) New York: Johns Hopkins University Press, 1996, 327-345) mentions the "... Hapless Tom Kuhn (who is horrified by this particular mangling of his theory of paradigms) and Richard Rorty are invoked like gods to justify an ultimately totally relativistic epistemology ..." (335). The relativist/constructivist misreading and appropriation of Kuhn is additional fodder for the recent "science wars." For example, Gross and Levitt (*Higher Superstition: The Academic Left and Its Quarrels with Science*. Baltimore: Johns Hopkins University Press, 1994) see a misreading of Kuhn as fundamental to feminist, constructivist accounts of science: "Only the most superficial reading of this work and of subsequent commentary by Kuhn on his critics can lend support to strong forms of relativism, a position that Kuhn is at pains most energetically to deny. He is a firm believer in scientific progress ... Moreover, he clearly believes that the dominant factors in theory choice are, indeed, the one traditionally celebrated by scientists: logical economy, explanatory parsimony, and the capacity to synthesize once-disparate theories into conceptual unity" (139).

interests of left, right and center across the entire spectrum of intellectual discourse. It is no wonder that Kuhn has 'regretfully' concluded that the success of *The Structure of Scientific Revolutions* rests on the fact that it is a text for all intellectual seasons and persuasions" (Restivo 1995, 99-100). While Hoyningen-Huene claims that Kuhnian theory can only be understood in its totality (xvi)²¹, *Structure* acts as a profound cultural and disciplinary resource.²²

Received in the 1960's social context of anti-scientism and Luddism, *Structure* inspired a wave of interdisciplinary conversion experiences.²³ The sins of closet historicists were absolved. The inquisition of the logical positivists began in earnest. The true believers – a bit grudgingly perhaps – admitted social scientists into the congregation. Excited talk began of paradigms and paradigm shifts. Even the liberal arts disciplines got religion. *Structure* promised not only a new era of disciplinary cooperation but the *elimination* of traditional

²¹ Hoyningen-Huene's brand of philology turns on a rather narrow conception of authorial intent. Still, Hoyningen-Huene's explication of Kuhn's philosophy of science (*Reconstructing Scientific Revolutions: Thomas S. Kuhn's Philosophy of Science*. Chicago: University of Chicago Press, 1993), recommended by Kuhn in the foreword, comes closest to answering questions of what *Structure* "really meant." The elements of Hoyningen-Huene's approach are two-fold. First, through extensive footnoting, Hoyningen-Huene offers a "hermeneutic approach" to "Kuhnian texts." This "philological standard" which Hoyningen-Huene employs is an attempt to render the author's "authentic meaning" from even "... incoherent, confused, or inconsistent ..." (xvii) readings. Second, Hoyningen-Huene spent a year (1984-1985) with Kuhn at MIT. Hoyningen-Huene was granted access to Kuhn and his unpublished work while, in return, Kuhn read, and subsequently approved, Hoyningen-Huene's drafts of *Reconstructing Scientific Revolutions*. Hoyningen-Huene mentions that he fails to address the origin of Kuhnian historiography (including the Conant school which Fuller (1992, 1994) emphasizes), criticisms of Kuhn, and parallels between Kuhn and other authors (Toulmin, Hanson and Feyerabend for example). While Hoyningen-Huene clearly errs on the side of authorial intent, Kuhn's complicity in supplying the raw material for the critical cottage industry created by *Structure* cannot be ignored.

²² Kuhn receives credit (or blame) for bringing sociology to bear on the study of science. "... Kuhn's discussion of social factors in scientific change in the early 1960s was a significant departure from positivistic and idealistic histories and philosophies of science ... with its conception of *revolutionary* science and its emphasis on the *persuasive* aspects of scientific discourse, persuaded many students of science that Kuhn's account differs substantially from the account given by Merton. But neither the works of Merton and Kuhn, nor their own testimonies, nor the course of science studies itself in recent years, confirm the widespread and tenacious rumor of a Kuhnian revolution in science studies. (Restivo 1995, 100) (original emphasis)

²³ Interdisciplinarity is commonly defined along a sliding scale. On one end interdisciplinarity acknowledges the need for collaborative research on narrowly defined set of questions; but the research itself does not entail rethinking the disciplinary status quo. On the other end interdisciplinarity refers to eliminating the traditional disciplinary order and asserting a meta- or supradisciplinary position (*Einheitswissenschaft*) – a science of science (meta-science) for example. The two-fold purpose of communication in an interdisciplinary context would be to help clarify concepts and skills and to help resolve different perspectives by integrating them. For example: Disciplines share many concepts. As Klein (1990) points out, the concept of "power" is relevant to almost all the social sciences. "Power" is also a concept used in literary analysis, natural sciences and engineering. Interdisciplinary communicators, for example, would highlight the ambiguities and assumptions of the definition of power within disciplines by listing its various definitions and finding the basis for integration. In proposing a composite definition, participants can challenge their conclusions from specific disciplinary perspectives. This process would take the form of the dialectic – an argumentative process in which contradictory propositions are asserted, compared and synthesized. The length of this process depends on the participants' patience, interests and resources. Appeals to interdisciplinarity conform to the point that all perspectives on a given subject must be explored in order to foster a proper critical, local understanding.

disciplinary boundaries. Contextual approaches to problem solving and questions of political economy were hailed as more sensitive and comprehensive to given issues. Traditional disciplinary resources could be concentrated on identified problems such as the relationship of science and society.

While Kuhn's broad effect is well-established, his intent, and the appropriation of *Structure*, remains a matter of interpretation and debate. "T.S. Kuhn" has come to exist, notes Restivo (99), "... [as] a cultural resource more or less detached from T.S. Kuhn, his writings and the social contexts of his argument." Sifting through the corpus of existing criticism on Kuhn is "... necessarily limited by its sheer volume and extreme heterogeneity" (Hoyningen-Huene 1993, xix); to borrow Malcolm Ashmore's (1989, 89) phrase and tense, the literature is "very large and is about to be increased."²⁴

By diminishing, or recasting the influence of *Structure*, Fuller wishes to create a public space in which experts and the laypublic can equally participate in policy decision-making. The Kuhnian model, Fuller claims, defeats efforts to open up science to public inquiry by co-opting academics, and others, into emulating, in their practice, the signature aspects of science – paradigm building and progressive research. The "wedge" to be used to pry loose Kuhn from STS consciousness, and to provide the foundation for a more open society, is the rhetoric of science. For Fuller:

Rhetoric of science ... reflects the natural interpenetration of theory and practice ... which abundantly illustrate[s] how distinguished humanists and

²⁴ Hoyningen-Huene (1993, xv) echoes Ashmore's sentiment by characterizing the secondary literature on Kuhn as "unmanageably vast." Of earliest significance, Dudley Shapere's review 1964 of Kuhn ("The Structure of Scientific Revolutions," *Philosophical Review* 73, 383-394) emphasizing the necessity of history to an understanding of science helped push earlier, and more popularly distributed, works by Stephen Toulmin *The Philosophy of Science: An Introduction* (London, 1951); *Foresight and Understanding* (London, 1961) and Norwood Russell Hanson *Patterns of Discovery* (Cambridge, UK, 1958) off academia's center stage. In describing Kuhn as "the least prominent" of a group of contemporary thinkers including Feyerabend, Hanson, Polanyi, and Toulmin, Fuller (1994, 83) conjectures on the reasons for *Structure's* incredible response. Shapere's review heads the list. Fuller (1992) argues that Shapere delivered *Structure* as a methodological Trojan horse to ensnare the remaining positivist philosophers which would come, ironically, to be worshipped as a sacred cow in STS. Kuhn's reception, and the historicist turn in philosophy of science, was consolidated from 1965-1970. In 1965, Kuhn's paper, presented at a conference at the London School of Economics ("Logic of Discovery or Psychology of Research?") would come to be included in Imre Lakatos and Alan Musgrave (eds.) *Criticism and the Growth of Knowledge* (Cambridge: Cambridge University Press, 1970). Other speakers at the conference included Popper, Lakatos, Toulmin and Feyerabend all of whom rewrote their papers in response to Kuhn. The publication of Lakatos and Musgrave's (1970) book (including Lakatos' "Falsification and the Methodology of Scientific Research Programmes"), and the arrival of the second edition of *Structure* (1970) (including a postscript response to critics), secured Kuhn's reputation as the accidental slayer of positivism. Appropriated to sponsor innumerable disciplinary initiatives, *Structure* proved instrumental to the formulation of the Strong Programme in the Sociology of Scientific Knowledge (SSK) as found in David Bloor "A Philosophical Approach to Science" *Social Studies of Science* 5 (1975): 507-17, *Knowledge and Social Imagery* (London: University of Chicago Press, 1976), and Barry Barnes *T.S. Kuhn and Social Science* (London: Macmillan, 1982).

social scientists use the resources of rhetoric to stem the tide of disciplinary fragmentation and the academy's growing irrelevance to public debate ... It goes without saying that the social epistemologist needs to establish credibility with both academics and policymakers. This is quintessentially a problem of rhetoric, namely, one of cultivating *ethos*. (1993 xiv-xv)

However, outside of defined academic and disciplinary settings, the formal tools of the rhetoricians trade seem ineffective:

...[I]f rhetoricians require a distinct domain of inquiry for their own legitamatory purposes, one can hardly blame them for conjuring the specter of hidden tropes and Aristotelian moments in the text they analyze. It is quite another matter, of course, to believe that anyone other than the rhetoricians in question ever finds these phantoms in the texts. I for one don't. I also don't believe that the rhetoric of science would be best served by staking out its own domain of inquiry. Instead the field should be more straightforwardly in the business of reforming existing domains (1997, 294)

Apparently, Fuller's solution to Kuhn's influence is to take a hard luck academic field (see 1993, xi), find expert resident practitioners, and, armed with the proper analytical tools, promote critiques of scientific practice. However, as can be seen in the interpretation of Kuhnian relativism in the case of rhetoric of science and the sociology of scientific knowledge (SSK), assertion masquerades as explanation. In STS the question of whether, and in what sense, science is rhetorical or social is precluded by the constructivist paradigm. Science is rhetorical or social in the way that rhetorical or social reality is sanctioned by constructivist studies of science. Currently, that sanction is quite broad but has no relation to science itself. Fuller's solution, in appealing to rhetoric, is circular. The posited serendipity between rhetoric of science and SSK, for example (see Gross 1996), is evidence to suggest the constructivist paradigm has anticipated the possibility of meta-level rhetorical accounts. Rhetoric of science, as currently fashioned, has no hope of bringing together the various interest groups in policy-making, because it has no relation, except in pedagogical service, to science. If Fuller abides by his argument (1992), *Structure* "rhetorically captures" the possibilities of a rhetorician's possibilities for critique (1993).²⁵

²⁵ I offer a twist to a process Latour (1987, p. 57) calls "captation" illustrated as: "All the objectors'(to a scientific claim) moves should then be controlled so that they encounter massive numbers and are defeated. I call **captation** (or *capatio* in the old rhetoric) this subtle control of the objectors moves."

3.4 Kuhn's Blueprint

The blueprint in *The Structure of Scientific Revolutions* can be read in at least two ways – as a basis for a foundational attack on an organized field (including one's own), or as basis for building a mature field. Obviously the two purposes are not mutually exclusive.

Kuhn's reticence in clearly articulating "the irrationality thesis" (in paradigm selection) and post-Kuhnian, radically relativistic interpretations of science also dominated fields such as rhetoric of science, the sociology of scientific knowledge (SSK) and STS. Commenting on Israel Sheffler's (1967) argument that Kuhn unjustifiably collapsed "second level" evaluative criteria, external to paradigms, into the internal structure of paradigms, Harris (1992) substitutes the terms "... collapsing meta-linguistic criteria into object language ones." "... [E]ven if one grants that criteria for puzzle-solving are internal to the paradigm which gives rise to the puzzle, it does not follow that standards or criteria for choosing amongst paradigms must also be internal." (80). Interpretations of Kuhnian relativism essentially "flattened" the level of meta-scientific critique which science studies could provide. As science was characterized as being "all" social, irrational, and/or ideological, no apparent difference existed between the meta-level discourse of STS practitioners and the object level discourse of scientists themselves. STS practitioners thought they were participating in the social construction of science. Adopting *Structure's* blueprint made STS a form of paradigm-based inquiry. Kuhnian relativism, propagated in STS as social constructivism, inoculated science from the possibilities of meta-level critique. The effect was to rob the theoretical wing STS of an historical mission, and awareness, outside of serving constructivist interests. No translation existed between the constructivist paradigm enabling STS critique, and paradigms governing the practice of science. While the constructivist paradigm remains entrenched in STS, the recent "science wars" suggest a paradigmatic crisis. Still the contexts to which Kuhn appealed in *Structure* to give accounts of science (history, philosophy, sociology and psychology) functioned within STS, under the constructivist rubric, as epistemologically undifferentiated tools. In this sense, history, like sociology and psychology, were subsumed within the broader narrative of the social constructivist paradigm. An epistemological equivalence was asserted regarding the value of context-based approaches. Consequently, any context – historical, social, postmodern – could be applied to, and serve as, an explanation of any scientific event. Moreover, the same scientific event could be explained by multiple contexts. As a result, science is portrayed as nothing more than the collection of context-based approaches applied to it.

Given the absence of meta-level perspective, and the “all-or-nothing” relativism of constructivists, that science is “social (rhetorical, masculine, irrational ...) all the way down” is a paradigm-fulfilling prophecy.

In STS, anitreductionist accounts of local scientific practices result in rival explanations which are treated as epistemic equivalents. The essentialist assumption that all science is social, for instance, results in an absence of a distinction between the theory, and the fact, that all science is socially constructed. As a result, distinct sociological explanations are given the same epistemic value. As such, any attribution can be made to a scientific event (e.g., the event is the result of rhetorical savvy, of having a stronger network, of being endorsed by government mandate) and can serve as an explanation. Connecting theory to fact requires a meta-theory which accounts for both theory and reality. Constructivists erase this distinction and offer no basis for adjudicating among rival explanations. Consequently, explanations of a scientific event from an STS perspective are subject to an infinite regress. For any designated scientific event, any social explanation is in play. Here, *Structure*, interpreted as endorsing relativism, denies an adequate account of representation that moves from explanations about science, to explanations of a given scientific practice, and to natural occurrences that scientific practice describes.

Fuller points out that social scientists, among others, were attracted to *Structure* as a narrative resource of scientific legitimation; neglecting the fact that Kuhn's historical examples were drawn almost entirely from physics and chemistry. Borrowing from J. Hillis Miller's account of the social function of narrative, Fuller suggests that the "clearly labeled plot structure of Kuhn's account of scientific change" has "verbally co-opted" sociological followers of the text in one of two ways: by scripting conceptual change and/or by dissipating challenges to the social order on which Kuhn's narrative depends. Rhetorically, then, Kuhn's sociological followers have been verbally co-opted into mistaking and substituting the object-level discourse of, say, political economy (in the use of terms such as "crisis" and "revolution") with the metaphorical sense of the narrative. Kuhn's narrative, Fuller contends, has headed off the radical and comprehensive elements of a critique of the natural sciences by the social sciences by casting metaphorically "elements that threaten the social order which sustains the narrative's legitimacy." *Structure*, therefore, has been used as a rhetorical means to maintain the autonomy and authority of science by defending the "organism" of science against interference in the process of growth; thereby relegating policy makers to the role of scientific product handlers. For example, Alvin Gouldner's attempt to distinguish the rational basis for a critical, reflexive form of empirical sociological inquiry (in *The Coming Crisis in Western*

Sociology) was, according to Fuller, co-opted by the desire of sociologists to follow Kuhnian paradigms and develop their discipline into a "real science."

Structure's rhetorical strength, Fuller suggests, developed in the absence of interdisciplinary criticism. Accordingly, if practitioners began to talk across disciplinary boundaries, the social order supporting Kuhn's narrative would also be shifted, and a more robust critical examination would follow. Steve Woolgar counters that "one needs to be cautious about interdisciplinary endeavors" promoting "pluralistic tolerance" – the reason being that the compromises and intellectual positioning necessary to get disciplinary practitioners to the table would "necessarily blunt the cutting edge of disagreement." Woolgar paints interdisciplinarity as "so coercive ... Those who resist the call to interdisciplinarity appear imperialistic, unyielding, difficult and, above all, unreasonable."²⁶

Fuller's solution to the problems of "Kuhnification" is two-fold. By diminishing, or recasting the influence of *Structure*, Fuller wishes to create a public space in which experts and the laypublic can equally participate in policy decision-making. To create this public space, however, Fuller appeals to the tools of fields which labor under Kuhn's influence – the rhetoric of science and the sociology of scientific knowledge (SSK). If *Structure*, as Fuller postulates, protects science from external criticism, fields built on Kuhn's blueprint will have no effect on changing scientific conduct. Yet, STS can be viewed as a logical extension of scientific development. Hence, *Structure's* influence has been largely anticipated by science itself. By concentrating on the scientific "image" (see Kuhn 1962, 1), the study of science has elevated the ontological status of its accounts; the construction has become reality. The tendency to reduce everything to the status of a construction is simply a way to try to eliminate the difficult philosophical spade work that needs to be done. As social constructivist arguments are hopelessly circular, no basis for adjudicating among rival claims exist. Statements *about* science are meaningful insofar as they show a coherent connection to scientific events and the natural world. Kuhn, interpreted as a relativist, suppresses this move.

²⁶ Steve Woolgar . "What is a Scientific Author?" M. Briotti and N. Miller (eds.), *What is an Author?* (Manchester, UK: Manchester University Press, 1993).

3.5 Developmental Theory as the Culture of Science

3.5.1 Preface

In order to provide a rather “remote” interpretation of *Structure’s* influence on STS, allow me to summarize previous ideas leading to the main points of the argument I give in this section.

Far from opening science to social criticism, Fuller argues, *Structure’s* effect was “conservative.” In the service of Conant, Kuhn “... had no sense of his own situatedness, especially the fact that the unique pattern of development he discerned in science was not simply an abstraction from the historical record but part of a larger strategy to normalize science’s social relations in the rapidly emerging ‘Atomic Age’” (1997, 130).²⁷ Fuller portrays Kuhn as doing the theoretical heavy-lifting in Conant’s plot, smoothing out the science/society relationship through Harvard’s General Education program. Whether or not Kuhn is Conant’s dupe, the relativist interpretation of *Structure*, which sustains social constructivism, has captured the day in STS. While Fuller may be right regarding *Structure’s* broader social influence, the effect of the relativist interpretation suffocated STS.

I argue the disciplinary blueprint accompanying *Structure* contains an “out” of social constructivism based, in part, on Piaget’s developmental theory.²⁸ Quite speculatively, I suggest Kuhn’s notion of scientific progress can be interpreted in terms of developmental theory. Piaget had mapped the logical structure, natural growth and transformation of a child’s cognitive development. Via Bruner and Postman, Piaget’s model finds its way into *Structure*. Science, as organism (see Fuller 1992, 270-271), can be viewed as developing in itself (according to an internal logic), not (necessarily) as developing toward truer descriptions of the world. What Kuhn found lacking in science, and supplied by history, was a way to see beyond paradigm-based inquiry. According to Bruner, Piaget’s model comes up short in a similar way. Piaget lacked a formal account of how moral judgment develops. Kuhnian science can be viewed, metaphorically, as a child who, absent social experience and a developed conscience, needs

²⁷ In a variation on this theme, I suggest that by making science “nothing special” – just like all social institutions – social constructivists were greeted by the public’s collective yawn. To see science as distant, menacing and hell-bent on progress, the public had an image of “the other” (even if false) against which to protest. While social constructivists may have shown that science did not live up its textbook hype, what institution did? Whether Kuhn, constructivism, or a confluence of cultural factors high-jacked the radical critique of science, the relationship between science and society, especially during a time of extraordinary western economic prosperity, has stabilized.

²⁸ Fuller (1992, 274, note 116) suggests that, “The link that Kuhn implicitly draws between a Piagetian child advancing to the next stage of cognitive development and a student reenacting a gestalt switch from the history of science comes out most clearly in Kuhn, “A Function for Thought Experiments,” in *Essential Tension*, 240-265.”

outside guidance. While scientific development required the focus of paradigm--based research, an external historical awareness needed to be developed. As both Fuller (1992) and Stephen Brush (1974) have argued history, by Kuhn, was operationalized to serve the kind of understanding which scientists found efficacious – generally labeled a “cognitivist” approach. However, as Kuhn’s vacillation suggests (as contemporaneously shown in Goodman), even if having a didactic purpose, the historical aspects of science can be identified, accessed and developed independently of the paradigm-based activity they describe. From a Piagetian perspective, then, STS can be considered the conscience in this stage of scientific development.

3.5.2 Piaget, Bruner and Goodman

Fuller (1992) argues that Kuhn’s primary influence was James Bryant Conant. True, Conant nurtured the institutional setting into which Kuhn’s work took pedagogical (in the General Sciences curriculum) and theoretical (in the publication of *Structure*) shape. However, the presence of two of Kuhn’s Harvard Colleagues, Jerome Bruner and Nelson Goodman, had more impact on Kuhn’s expressed thought.²⁹ Bruner received his Ph.D. from Harvard in 1941, and after serving in the psychological warfare section under Eisenhower, returned in 1945, and was appointed Professor of Psychology in 1952. Bruner’s participation in the “cognitive revolution” (as Director of the Center for Cognitive Studies at Harvard) had a profound impact on United States education theory in the early 1960s. The work of Jean Piaget figures prominently in Bruner’s work.³⁰ Piaget’s “logical theory” concerning the way children deal with intellectual tasks during specific developmental stages lies at the heart of Bruner’s

²⁹ Hoyningen-Huene (*Reconstructing Scientific Revolutions: Thomas S. Kuhn’s Philosophy of Science* Chicago: University of Chicago Press, 1993) notes that: “Several connections with other traditions have, furthermore, been acknowledged on several occasion by Kuhn himself. The include debts to Conant school historiography; the historiography of Koyré and his school, which in turn harness back to neo-Kantianism; Piaget’s developmental psychology; gestalt psychology; Fleck’s sociology of science; Whorf’s linguistic theory, Wittgenstein’s later philosophy; and the philosophy of Quine” (xviii). Hoyningen-Huene remains content to deal with the influence of Koyré, Kant and Popper’s critical rationalism.

³⁰ “Piaget turned to the logician and the epistemologist for his account of how logical *Structure* are formed and then transformed ... For Piaget, growth happened naturally ... The drama consisted in honoring its natural growth, not in comparing its present status with what it would later be or might become under some special curricular dispensation. It is respectful explication of the self-sufficiency and dignity of the child’s mind *in terms of its own logic* that is now finding its way into the canonical form of the culture. Piaget’s motto, ‘To learn is to invent,’ may yet alter the view that to teach is simply to transmit, to fill a vacuum ... Particularity, localness, context, historical opportunity, all play so large a role that it is embarrassing to have them outside Piaget’s system rather than within. But they cannot fit within. Any more than ‘local expertise’ with no over spill into ‘general intelligence’ can be fitted into the Piagetian system of the stages of intellectual development ... More modestly the system failed to capture the particularity of Everyman’s knowledge, the role of negotiations in establishing meaning, the tinker’s way of encapsulating knowledge rather than generalizing it, the muddle of ordinary moral judgment” (141, 147). Jerome Bruner *Actual Minds, Possible Worlds* (Cambridge, MA; Harvard University Press, 1986).

thinking. The refined use of developmental tools, like language, to “encode reality” became the basis for Bruner’s pedagogical theory.

Held two years before the initial publication of *Structure*, the Woods Hole Conference, sponsored by the National Academy of Sciences, was convened to discuss science teaching in the public schools. The final reports of the conference were presented in Bruner's book *The Process of Education* (1960). Even though the primary focus of the conference was science education, Bruner found an application for Piaget's model of cognitive development in writing instruction. Earlier, Bruner had brought Piaget to the attention of Kuhn while lecturing at the Harvard School of Education and through his influence on Conant's General Education curriculum. During the sixties (in book publications in 1963 and 1966), Bruner came to influence the funding of decisions of the U.S. Office of Education for research projects in English. Later, through the work of Nelson Goodman, Bruner would come to more fully integrate Piaget's developmental theory with Goodman's neo-Kantian constructivism. Bruner's interpretations of Piaget, funneled through his gestalt experiments, would come to be the cornerstone of Kuhn's conception of "revolutions as changes of world view:"

Only after such transformations of vision does the student become an inhabitant of the scientist's world, seeing what the scientists sees and responding as the scientist does. The world the student then enters is not, however, fixed once and for all by the nature of the environment, on the one hand, and of science on the other. Rather, it is determined jointly by the environment and the particular normal-scientific tradition that the student has been trained to pursue. Therefore, at times of revolution, when the normal-scientific tradition changes, the scientists perception of his environment must be re-educated—in some familiar situations he must learn to see a new gestalt (1970, 111-112).

Partially realized in Kuhn's notion of a tradition-bound field of research were boot-strap cognitive and social mechanisms for a scientist to re-educate herself after a paradigm shift. Mayes (1983, 170) contends that for Piaget "... rational discourse arises as a result of an interchange of ideas or propositions between individuals. This interchange can be described in terms of what sociologists nowadays call social exchange theory ... Thus the feelings we experience and the normative judgments we make are to be described in terms of transactions between ourselves and others" (170). Bruner held with Piaget that "... our thought activities can manifest logical structures without our being fully cognizant of them, although we can become conscious of them at a later date" (Mayes 1983, 177). Mayes suggests that Bruner had misread Piaget's implied theory of social exchange, in that Piaget spoke of the formal

structures of thought, "... as they occur in our thought processes, are a function of our relationship to others and the way we adapt ourselves to the world around us" (179).³¹ In effect, Bruner, in interpreting Piaget, had come to overemphasize the cognitive aspect of the structure of formal reasoning in relation to individual development. With respect to Bruner's work in the 1960s and 1970s Mayes seems right. However, Bruner's later work became increasingly influenced by the work of Nelson Goodman.³² Goodman provided a way to incorporate Piaget's developmental logic with neo-Kantian (or linguistic) constructivism.

Goodman's brand of constructivism implies that the world that we know and perceive is the product of individual cognition. No aboriginal reality exists. We are born into the process of thought directed by the use of language. We are supplied with tools and materials which shape thought (ontological givens), but, as we are enveloped in language, we cannot get "outside" the process of construction to the real world. All we have are constructions. Bruner (1986) suggests that: "Even Piaget, whose epistemological theory was a constructivist one – with more elaborated constructs encompassing simpler ones in the course of growth – clung nevertheless to a residual naïve realism. Constructions for him were representation of an autonomous real world to which the growing child had to fit or 'accommodate.'" (98) Goodman takes a good deal of time trying to defend his position against radical relativism. To this end, Goodman distinguishes between "versions" and "worlds." "Versions", for example, may or may not be true. Goodman remains fairly obscure about the distinction. On Kuhn's nomenclature, a rough correspondence can be drawn between Goodman's notion of a "version" and a paradigm. However, Kuhn (1962, 121) matches Goodman's obscurity: "... though the world does not change with a change of paradigm, the scientist afterward works in a different world." ³³ At least

³¹ Wolfe Mays "Reflections on 'The Growth of Logical Thinking'" *Jean Piaget: An Interdisciplinary Critique* Sohan Modgil et al. eds. (London: Routledge & Kegan Paul, 1983).

³² The later works of Goodman to which I refer, and which came to influence Bruner, were: *Of Mind and Other Matters* (Cambridge, MA: Harvard University Press, 1984) *Ways of Worldmaking* (Hassocks, Sussex Harvester Press, 1978) and *Languages of Art: An Approach to a Theory of Symbols* (Indianapolis: Hackett, 1976)

³³ Hoyningen-Huene (*Reconstructing Scientific Revolutions: Thomas S. Kuhn's Philosophy of Science* Chicago: University of Chicago Press, 1993) points to Kuhn's (1970, 150) attempted clarification of two meanings of "world" and "nature": "In a sense that I am unable to explicate further, the proponents of competing paradigms practice their trades in different worlds." In summary, Hoyningen-Huene suggests on one meaning, Kuhn is referring to the world governed by paradigms – the world in which the scientist's practices take place. On the other meaning, Kuhn is referring to "... something which itself remains untouched and unfenced by revolutionary change in science" (33). Hoyningen-Huene draws the distinction between the subject-sided elements of the known, or knowable world (the phenomenal world), and the object-sided elements of the unknowable "world-in-itself." Hence, one cannot have empirical access to the object-sided world. Hoyningen-Huene suggests that Kuhn wanted to ward off naïve realism and the concepts of scientific progress which accompany it.

during the time of the first and second editions of *Structure*, Kuhn appears to endorse a form of constructivism closer to Piaget than to Goodman.

My contention is that the reading of Kuhn as a garden-variety relativist is too broad. Historically situated, Kuhn, in *Structure*, can be read as a budding “mental constructivist.” However, as attempts at clarification suggested, Kuhn was not completely sure what mental constructivism, as devised in *Structure*, entailed. Evidence of the catholic influence of Piaget, as well as Bruner and Goodman can be found most profoundly in Chapter 10 (“Revolutions as Changes of World View”) in *Structure*. Kuhn (1962) footnotes (15 and 17, 123) Alexander Koyré (who is footnoted elsewhere) with whom Goodman finds a special affinity (see *Languages of Art: An Approach to a Theory of Symbols* Indianapolis: Hackett, 1976 and *Ways of Worldmaking* Hassocks, Sussex: Harvester Press, 1978), and Goodman’s (see footnote 19, page 126) *Structure of Appearance* (Cambridge, MA: 1951). Although crucial experiments are oft-disputed, Kuhn’s theory regarding anomalies and scientific discovery can be largely credited to the outcome of the Bruner and Postman experiments (see footnotes 12, page 63 and 13, page 64). On this reading, Kuhn is responding directly to the cognitive revolution of the 1950’s which includes Bruner, Herbert Simon, George Miller and Noam Chomsky.

Structure is credited with inspiring nonreductionist accounts of the relation between the “special sciences” (such as biology and history) and the basic physical sciences (such as physics). “The post-positivist recognition of the relevance of the various special science and their histories...” (Boyd 1991, xii) is captured by Kuhn’s admonition that history could “... produce a decisive transformation in the image of science by which we are now possessed.” (1962, 1) Moreover, in the preface to *Structure*, Kuhn notes the influence Ludwig Fleck’s work had in “... making me realize that those ideas might require to be set in the sociology of the scientific community” (ix). As well, Kuhn’s year at the Center for Advanced Studies in the Behavioral Sciences led to the inclusion of gestalt theory, demonstrated by the Bruner and Postman experiments (62-63), to explain the recognition of anomalies. The apparent ease with which Kuhn applied social scientific methods to scientific development suggested an undifferentiated form of meta-scientific explanation. For example, while gestalt psychology can show how one perceives, then identifies, anomalies (like a red six of spades), one could forward a sociological explanation as to why the member of a given group (raised during the advent of video games) may, or may not, identify a similar perceptual anomaly. Kuhn did not directly address the question of whether, or in what way, any, or all, of the special sciences were efficacious in explaining any, or all, aspects of science.

Taking the broadest interpretation of Fuller's reading, let us assume *Structure* circumscribes the development of STS. Initially, Fuller argues that Kuhn succeeded in producing a "didactic macrohistory of science" – a genre of writing "... common in the late eighteenth to the mid-twentieth centuries ... [a] didactic macrohistory of science. A book of this sort purports to draw general lessons from the unfolding of our collective cognitive development ... by arranging historical precedents in a suitably illustrative manner, and contesting the arrangements that others have made ... showing how ... history dramatizes one's favorite abstract arguments" (272-273). Kuhn's version of history, for Fuller, is "... unlike Hegel's dialectic [in that] the life cycle of a Kuhnian paradigm repeats without making progress" (273). *Structure* reinforces the kind of cognition, which displays an "Orwellian" sense of history (see Kuhn 1962, 166; Fuller 1992, 273-274), necessary for paradigm-based science. If *Structure* acts as a conceptual script, STS follows a parallel, paradigm-based development with science. Fuller finds a "double truth" emerging from Kuhn's history science "... a heroic history to motivate scientists in their daily activities [and] a messy despiriting yet down-to-earth history.." produced by historians for other historians. And yet, as found in Kuhn's argument for the importance of history to science, at the level beyond textbooks are necessary truths about scientific conduct to which scientists do not have ready access.

Fuller identifies Kuhnian science as an "... Aristotelian picture of science-as-organism ..." Scientific research possesses a more or less natural lifecycle moving from one paradigm to the next (1992, 270-271). If Kuhnian science can be defined as having a lifecycle at the level of paradigm-based research, then macro-scientific development can be similarly characterized. STS, then, progresses to an unknown end. The conservative, or paradigm-based, influence that Fuller posits turns on a reading of *Structure* as an invitation to contextualize science within discipline-based frameworks. In order to grow, STS must move beyond applying the conceptual technologies available from the (primarily) social sciences to science. If one assumes, as Fuller does, Kuhn's historiography is deterministic, STS will, by historiographic necessity, develop a unique meta-scientific inquiry. My basis for defending the presence of a evolutionary model within STS is based on Kuhn's teleology (see 1962, 171-172), and his interpretation of Piaget and Bruner. Kuhn points to a broader notion of representation which bridges science and meta-science.³⁴ Science, understood on Piaget's model, must develop a mature reflective awareness. The first stage of this awareness was necessarily Orwellian.³⁵

³⁴ Meta-scientific claims are descriptive and normative statements about the conduct of scientific practice, or about how scientific practice ought to be conducted, from various disciplinary, interdisciplinary, and contextual perspectives. Meta-scientific claims answer to the broad need for an epistemological basis on which competing descriptions of scientific practice can be adjudicated.

As science has begun to develop a reflective awareness, so too must STS develop a refined awareness in which true and false claims about science can be distinguished. Fuller's account of Kuhn stands as an example. Given that Fuller offers a critique of Kuhn's philosophy of science which, in turn, describes the structure of science which, in turn, describes the natural world, does STS have to account for a coherence among these levels of representation? Does, then, "second-level" or meta-scientific knowledge possess a unique epistemological structure? I will turn to these questions in the next chapter.

3.6 Kuhnian Pedagogy and Interdisciplinarity

Kuhn's pedagogical take on Piaget and Bruner's model of cognitive development can be formulated as a prescription for scientific discourse with two distinct purposes. One purpose has been to pose conventions of expression, especially scientific writing, as seemingly asocial sets of instructions to be repetitiously followed by students indoctrinated into a given scientific paradigm. These conventions (e.g., form, content, citation patterns) would be used to maintain the image of science as a largely self-sustaining project with an audience of like-minded thinkers possessing roughly the same amount of knowledge about a given subject. Appreciating the conventions of expression, and not blindly following them, the neophyte would be able to easily situate herself within the practice of normal science, while, as an experienced practitioner, coming to realize the constraints and opportunities these conventions afford. Aspects of linguistic reference would also be couched in the manner of these conventions and set as a series of institutional priorities. As a result, the anti-realist radicalism of neo-Kantian constructivism would be diffused through the access to meta-cognitive and social perspectives made available through a series of recursive developmental mechanisms. That is, the linguistic conventions present in a particular period of normal science would be recognized by practitioners and could be revised accordingly. Here, the scientific rhetor has been attributed with a great deal of expressive and creative intentionality; corresponding to modernist conceptions of the relation between author, audience and text, and augmented by constructivist doctrine and the role assigned to language in creating reality.

³⁵ Fuller, however, challenges the kind of disciplinary evolution dictated by *Structure*. Citing recent exchanges in the so-called "Science Wars." Fuller notes that debate centers on who is able to make pronouncements on the nature of science. "... [P]ublic reaction to these exchanges has been irritation at both [sociologists and scientists], for they lack sensitivity to the future of science. In that sense Kuhn's famous evolutionary model of scientific change as progress *from* that is not a progress *to* has become a self-fulfilling prophecy..." (original emphasis, 1998 forthcoming, Chapter 7, 1).

Another purpose attributed to the pedagogical lessons of Kuhn has been to bring about a form of scientific discourse through which the public, from an informed understanding, and hence, appreciation of science, would have access to issues involving science and society; scientific funding, for instance. In STS, conceptions of scientific thinking have been cut loose from their gestalt and Piagetian moorings, socialized, and shown to be accessible to laypersons and scientists alike through interdisciplinary contexts. The scientist, then, does not have a clear and distinct idea of the logical structures she uses in problem solving, rather these structures are (depending on the brand of constructivism) constituted or mediated by social relations and language. Politically, an endorsement of social constructivism has been equated with populism and democratic pluralism. In the quest to demystify science and make science "more democratic", social constructivists have claimed the moral high ground.

Whether or not Piaget, Vygotsky and/or Polanyi describe an actual state of affairs is beside the point. What matters seems to be the fundamental reconception of the narrative (either local or global) in which science and science studies are cast. Here, the scientific rhetor is less aware of the social structures influencing her communicative choices, while the static conception of author, audience and text have been placed in a postmodern context.³⁶

The form of reflexive awareness made by subscribing to Kuhnian-style programs is illustrated Charles Bazerman's *Shaping Written Knowledge*. Michael Gorman found that in railing against the "unreflecting slavery to current practice" (171) taught to students of technical communication, Bazerman advocates "a kind of meta-cognitive awareness of goals and contexts, but does not situate it in the appropriate literature, or in the practices of writer and editors discussed in earlier chapters" (171). Bazerman's eclectic synthesis of the social and linguistic elements of science attempts to "... reconcile social constructivist and empirical views of science by coupling a Vygotskian gloss that is popular in composition studies, with Ludwik Fleck's views on scientific activity" (171). Hence, the scientific rhetor possesses a kind of meta-cognitive and meta-social "... awareness of goals and contexts" which can be derived from

³⁶ Woolgar, for example, (in Biriotti and Miller) looks at conventional concepts of scientific authorship in order to devise how "... certain key ambivalences in both theoretical and empirical work in SSK" can be "exploited." These analytic ambivalences, argues Woolgar, lie at the heart of the significance of SSK by challenging more generally accepted forms of representation in scientific practice. As a result, Woolgar's recent advocacy of new literary forms (1988) has been characterized "as an essential aid to an authentic reflexive practice" (Ashmore 1989, p. 83) by merging programmatic disciplinary concerns (vis-a-vis Bloor 1976) with practical outreach (e.g. providing alternative forms of scientific expression). However, it is Woolgar's "distrust" of pluralism in the "seductive guise" of interdisciplinarity that illustrates the attempt of reflexivists to manage and capitalize analytic tension between theory and practice.

regularities in social forms of scientific experimentation and communication.³⁷ "Regularities," states Bazerman:

... occurred because individuals perceive situations as similar and make similar choices. Institutionalization and codification occurred because repeated choices appear to the collective wisdom (or wisdom of a few powerful actors) to be generally and explicitly advisable ... References, citation practices, and embedding of contributions in theory gave textual form to the increasing explicit intertextual activity of each individual author. The success of the genre in carrying out the business of the scientific community has also turned the genre into another kind of social fact, as an authoritative model to be emulated by other disciplines, interpreted through their own perceptions and problems (316).

Although textbooks, in presenting scientific discourse as purely referential, have failed to address the constitutive nature of discourse (as mediating reality), Bazerman argues that it is a function of this same set of discursive regularities (or norms) that make meta-cognitive and meta-social perspectives available to scientific rhetors. Once scientists (or science studies researchers) begin to talk about the regulative function of language, then the constitutive elements become apparent. But Fuller's thesis denies the progressive moves Bazerman sees possible through "regularized discourse." *Structure*, in this case, may serve as an anticipatory narrative, one of the affects of which is to instantiate an "Orwellian" sense of history for paradigm-bound practitioners, thereby influencing what meta-cognitive and meta-social perspectives are accessible.³⁸

Central to arguments legitimating interdisciplinary study of science has been the "bold pronouncement that something new is happening" (Diesing 1991, 196). Kuhn is often interpreted as lending the basis for the call to the interdisciplinary study of science. The rise of SSK and the rhetoric of science provide cases in which the narrative elements of *Structure* are appropriated to legitimate context-based explanations of scientific practice.

³⁷ Michael Gorman "Review of Charles Bazerman, *Shaping Written Knowledge: The Genre and Activity of the Experimental Article in Science*" *Social Studies of Science* (Vol. 20, 1990, 169-172)

³⁸ Fuller argues: "But once Kuhn became a proficient instructor the ... more Piagetian Style predominated, which focused the students attention only on salient aspects of scientific episodes that were necessary for recognizing and resolving some paradigmatic tension. Here we find the Orwellian historical perspective that enabled students in Kuhn's course to acquire the same kind of understanding of science that Conant sought." ("Being There With Thomas Kuhn: A Parable for Postmodern Times" *History and Theory* Vol. 31, No. 3, 1992 p. 273-274 . Questions of Kuhn's pedagogical aptitude and success aside, the implication of Fuller's position is that adopting and fashioning a paradigm-based research program may result (keeping in mind the difference between scientific and non-scientific forms of inquiry) in the kinds of institutional historical memory loss which Stephen Brush ("Should the History of Science Be Rated X", 1974) noted.

A subversion strategy, Kuhn's "revolution" is more promising if there is a small group willing to pursue it together. They can announce a new paradigm, cite each other's writing, set up conferences published as edited volumes, and (they hope) make a big enough splash to attract disciples. If they succeed, they immediately become the community elite, accumulating symbolic capital rapidly in a stream of publications and citations and appointments and research grants. The mircosociologists are an example of a group pursuing a successful subversion strategy. Their early articles are full of bold pronouncements that something new is happening, something important is being studies for the first time, a start is being made, science is now advancing (196).³⁹

Rhetoric of science and SSK share more than a family resemblance to the collective endeavor of science studies. Although the value of rhetoric of science and SSK in offering (Ashmore 1989, Gross 1990) redescription of selected theories and practices posed under the rubric of "science" continues to be debated (see, with respect to rhetoric, Gross and Keith 1997), both fields have pursued programmatic reflexivity. "Studies" founded in the name of the Kuhnian paradigm, especially in the rhetoric of science, or the opportunities made available by the narrative structure of *Structure* – have been fully anticipated, or bracketed against a specific relation to the metaphysics of science. Barnes (1982, 15), for example, offers a related position:

It could even be argued that work in the sociology of scientific knowledge has relied too heavily on Kuhn, whose academic interests have not at all been identical with those of social scientists. Kuhn has not sought to develop sociological theory, or to understand knowledge and culture in the most general possible terms. On the contrary, his explicit aim has been to discover what is particularly distinctive and efficacious in scientific research, and he has tended to discourage the extension of his ideas to forms of culture other than science (cf. Kuhn, 1969).

Cases of disciplinary retrenchment, and calls for separate subdisciplinary identity (e.g., composition studies) may be evidence for this point. Likewise, it has been postulated that the truly radical implications of *Structure* have been worked out better by someone else, or "lost" entirely (Bazerman 1988, 295, Fuller, 1992, 274). In a postmodern vein, the need for

³⁹ Diesing's quote is framed in Shadish and Fuller (eds.) *The Social Psychology of Science* (New York: Guilford Press, 1994): "One might ... speculate about the pervasive impact that SSK has had in the last decade on a science studies literature in which SSKers were a distinct minority. Diesing (1991), for example, describes them as using minority influence tactics extensively:... at least some treatises on reflexivity go out of their way to convey the impression they are not trying to convince the reader of their position (Woolgar 1988, Ashmore 1989). Similarly, SSKers are consistent; they always follow the same game plan of deconstructing our common way of seeing science. Finally, SSKers' positions on science studies tend to be extreme in many respects relative to the positions of other sociologists and philosophers of science. All this would lead us to expect SSK to have a particularly large impact on majority opinion in science studies – to get their attention, at a minimum (e.g., Laudan 1990), and probably to change how they think about science in at least small ways."

programmatic reflexivity in SSK and rhetoric of science may be answered, or completely eliminated, if the Kuhnian narrative, as a source of for legitimating and grounding studies of science, was abandoned.

Collapsing meta-linguistic criteria into to object language criteria of science has the following effect in the rhetoric of science. Given the ambiguity surrounding the ontological status of "rhetorical phenomena" in science, rhetoricians have relied on a "serendipity" between structuralist sociological accounts of science and rhetoric to locate "rhetorical effect." In advancing an interdisciplinary rhetoric, and, pedagogically, the rhetorical skills of scientific rhetor and layperson, rhetoricians have relied on a similar form of reflexive awareness in which a discipline or actor has access, through an interdisciplinary perspective, to cognitive and social structures. This form of reflexive awareness has, in essence been scripted by Kuhn and roughly substitutes as a form of realist ontology. While persuasion does act as a social and cognitive force in science, it does not follow that rhetoric leads to a particular action. If a causal relation can be asserted, the question becomes empirical, but rhetoricians have failed to offer a convincing *a priori* argument, evidenced in their philosophical and sociological eclecticism, for rhetorical causation. While rhetoricians, then have departed from "... the humanistic tendency affinity of articulating the "ideal reader," one who knows everything that could be known at the time about his or her discursive situation, but who also enjoys the leisure of applying that knowledge to a comprehensive understanding of an author's meaning" (1997, 288) they have transferred this ideal to the interdisciplinary project of accounting for as many perspectives as possible.⁴⁰ The ideal reader and writer simply take a thoroughgoing interdisciplinary perspective. Kuhn's "demystification" of science by combining historical and philosophical arguments has been fashioned into a meta-narrative containing the interpretive elements for reading and writing scientific texts.

So how do you script an interdisciplinary classic? Fuller offers a perspective based on the reception of *Structure* :

There is Kuhn's audience's peculiar reaction to *Structure*. A common thread that runs through the formal and informal comments that people make about the book is that it is quite thin in their own field of expertise, but truly enlightening in some other field, one in which they have had an interest for a long time, but could not locate a suitable point for scholarly intersection. We might say then, roughly speaking, that *Structure* has a philosopher's sense of sociology, a historian's sense of philosophy, and a sociologist's sense of

⁴⁰ Steve Fuller "Rhetoric of Science': Double the Trouble?" *Rhetorical Hermeneutics: Invention and Interpretation in the Age of Science* Gross and Keith (eds.) SUNY Press, New York, 1997, 279-298.

history. A text with these characteristics is assured a good reception just as long as the practitioner's of the different disciplines continue talking only to their own colleagues and not to those of the field Kuhn supposedly represents so well for them. At that point, the day when (if!) inquiry de-specializes, the attraction of Kuhn will fade.⁴¹

The irony of successful interdisciplinary research, as inspired by interpretation of Kuhn's relativism, is that it obviates contact with the practitioners from other disciplines. A main line of argument for rhetoricians, as well as STS practitioners, has been that changing the image of science from an autonomous institution to a social institution like all others, opens the avenue to greater public participation in scientific decision making. Still, it needs to be shown clearly how disciplinary debates about science, even in an interdisciplinary context, can be translated into public concerns, debate and participation in science.

3.7 Conclusions

It is as if a postmodernist aversion to proffering master narratives has forced the STSer into a role of simply stripping away narratives that "others" have imposed on the subject under study, all the while hoping something meaningful will remain to be said. In the event that this does not happen, one can simply revel in the "chaotic" or "rhizomic" character of the subject's behavior ... Currently, STSers collapse the breadth and depth of knowledge claims into the semantic blackhole of "contingency," leaving the impression that any belief anywhere is always up for grabs. In this way, strong grounds are provided for producing indefinitely many case studies of "science in action," in order to display the full range of contingency, but absolutely no grounds are given for thinking that an overarching socio-epistemic strategy could ever significantly alter science and technology's place in the world. (Steve Fuller, "Kuhnification as Ritualized Political Impotence: The Hidden History of Science Studies" in *Being There With Thomas Kuhn: A Philosophical History of Our Times*, forthcoming, 1998)

Contingency acts as the minion to the social constructivist's master narrative in STS. While Fuller clearly places the blame for STS's truncated development at Thomas Kuhn's front door, I argue that social constructivist's interpretation of *The Structure of Scientific Revolutions* (1962) within STS serves as a form of paradigmatic-based (or universalistic) inquiry.⁴² In so

⁴¹ "Being There With Thomas Kuhn: A Parable for Postmodern Times" *History and Theory* (Vol. 31, No. 3, 1992)

⁴² Fuller (1998) suggests in identifying the "pragmatic paradox" ("context is all" and "all is context") that many STS scholars "... accept a universal method for studying science, as defined, say, by Bloor's four principles of the Strong Programme, Harry Collins' planks of the Empirical Programme of relativism or Latour's Rules of Method." I agree, but as Fuller credits the trend toward methodological universalism to paradigmatic inquiry found directly in Kuhn, I make the slight distinction that the constructivist

doing, I have argued for two readings of Thomas Kuhn's which recast the role of social constructivism within STS. These readings are based on the working premise that *Structure* is the foundational text of STS. Even if, as arguments by critics and proponents of STS alike, *Structure* was misinterpreted as endorsing the idea that science is a subjective enterprise, Kuhn provided a basis for repudiating the metaphilosophical apparatus that is the consequence of social constructivism.

Fuller (1998) has extensively argued as to the way in which *Structure* led to a given sociological perspective in STS. However, in endorsing the basis of Fuller's argument, I shift the focus somewhat. Fuller (1992) describes the socio-historic circumstance that gave rise to *Structure*. James Bryant Conant's purpose, which Kuhn succeeded in reproducing, according to Fuller, was to cast history as a didactic mechanism for scientists to solve developmental crises in science. As these crises could be handled internally, society did not need to fear scientific progress. As a twist to Fuller's argument, I suggest the constructivist interpretation of Kuhn did more to show the human face of science. If science were assumed to be another social institution, then public strategies were already available for making policy. *Structure* acts as a developmental blueprint for fledgling disciplines, like STS, and, as result, the subversive consequences of the STS deconstruction of science are bound in servitude to the social constructivist paradigm. On Fuller's (1998) reading the:

...Kuhnian legacy has made the study of science a relatively self-contained project, innocent of any obvious interest of providing a comprehensive theory of society. In recent years, some effort has been made to incorporate these macrosociological factors, but typically this occurs at the level of "discursive resources," whereby the sociologist imputes, say, beliefs in class or status differences to the agents under study without committing herself to the (in)validity of those beliefs.

While I agree with the sentiment of Fuller's argument, my reading of Kuhn, and the subsequent appeal to context on behalf of STS practitioners does suggest an ontological and epistemological commitment to the validity of theoretical commitments.

The initial move Kuhn makes on the first page of *Structure* is to invoke that which influences, and is influenced by, paradigmatic inquiry, the history of science. While Kuhn's goal, assuming Fuller is correct, may have been didactic, the point remains that Kuhn assigned privileged status to one set of ontological commitments – the validity of which could be questioned. Implied in choosing to "impute" sociological motives to an agent is the researchers

interpretation of *Structure* was immediately developed and readily adopted. As Fuller's own project suggests, other interpretations of *Structure* in STS were suppressed.

necessary justificatory commitment. If any sociological motives can be ascribed to an actor then the researcher is forced into a form of Fuller's "pragmatic paradox" or to infinite regress. However, that the sociological context of class can be designated as, in any way, causal a justificatory logic is implied. On a reading of the developmental theory adopted by Kuhn in *Structure*, I believe the bootstrap mechanism for showing how meta-level scientific critique can be seen to be of the world. If the interpretation of Kuhn offer here is wrong, I provide a philosophical argument for my position in the next chapter.